

**PATENT APPLICATION**  
(CLEAN Substitute Specification for S/N 10/792,078)  
Docket No. 42085-00031USD2; China Patent Agent Docket No. FPEL04150018US

**ELIMINATION OF ELECTRIC-POP NOISE  
IN MR/GMR DEVICE**



**CROSS REFERENCE TO RELATED APPLICATIONS**

[0001] This application is a divisional application of U.S. Patent Application Serial No. 10/317,878, filed on December 12, 2002, which is a divisional application of U.S. Patent Application No. 09/265,083, filed on March 9, 1999, now issued as U.S. Patent No. 6,583,971, and is incorporated by reference herein in its entirety.

**BACKGROUND OF THE INVENTION**

**Field of the Invention**

[0002] The present invention generally relates to an active device capable of converting an electrical signal into a voltage, more specifically, to a magnetic recording head consisting of either an anisotropic magneto-resistive (hereinafter referred as AMR) or giant magneto-resistive (hereafter referred as GMR) sensor along with an insulation spacer and magnetic shields.

**Description of the Related Art**

[0003] As is well known in the field, the insulating spacer in AMR/GMR recording heads is becoming thinner and thinner in order to increase a linear recording density. Inevitably, we are facing electric-pop noise resulting from the thinner spacer. For high manufacturing yield and reliability of electric and magnetic performance, such electric-pop noise must be eliminated.

[0004] US patent No. 3864751 entitled "Induced Bias Magneto-resistive Read Transducer" issued to Beaulier and Napela, on February 4, 1975 proposed that a soft-adjacent magnetic transverse bias layer (hereinafter referred to as "SAL") is isolated from a magneto-resistive device (referred to as "MR" hereinafter). The patent did not reveal any methods how to make it. Another key point is that the MR and SAL are electrically isolated. In the prior art described by Beaulieu et al., electric-pop noise is present if a thinner insulating spacer (<150 Å), such as Al<sub>2</sub>O<sub>3</sub>, is used. Otherwise, the devices would need a thicker SAL to bias the MR if a thicker